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(21) International Application Number: PCT/US99/18267 (22) International Filing Date: 11 August 1999 (11.08.99) (30) Priority Data: 60/096,032 11 August 1998 (11.08.98) US (71) Applicant (for all designated States except US): RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY [US/US]; Old Queens, Somerset Street, New Brunswick, NJ 08903 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): KIRBY, Edward, G. [US/US]; 101 Childs Road, Basking Ridge, NJ 07920 (US). CANOVAS RAMOS, Francisco [ES/ES]; Ubanizacion Retamar, Calle Velero, 17, E-296130 Alhaurin de la Torre (ES). GALLARDO ALBA, Fernando [ES/ES]; Ubanizacion Sol de Benamaina 6, Calle Amatista, E-269631 Benalmadena (ES). (74) Agents: KLANN, Ellen, M. et al.; Dann, Dorfman, Herrell and Skillman, Suite 720, 1601 Market Street, Philadelphia, PA 19103 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: TRANSGENIC TREES HAVING IMPROVED NITROGEN METABOLISM (57) Abstract <p>Nitrogen is one of the principal factors limiting vegetative production. The present invention has improved the nitrogen metabolism in Poplar by integrating a transgene constitutively expressing a pine glutamine synthetase into the plan genome. The resulting transgenic trees exhibit higher growth rates, protein and chlorophyll contents, and leaf area than equivalent untransformed trees. It is contemplated that this approach to nitrogen improvement will be equally successful for all woody perennials. Provided with the invention is an expression cassette, a vector, and a method for increase glutamine synthetase activity in woody perennials, as well as transgenic woody perennials with enhanced nitrogen metabolism and accompanying phenotype.</p>		